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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,836	04/15/2004	Vinh Q. Nguyen	N.C. 83,119	6849

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Naval Research Laboratory, Code 1008.2
4555 Overlook Ave., S.W.
Washington, DC 20375-5320

EXAMINER

LAZORCIK, JASON L

ART UNIT	PAPER NUMBER
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1731

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/824,836	Applicant(s) NGUYEN ET AL.	
	Examiner Jason L. Lazorcik	Art Unit 1731	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 April 2004.
 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 1-12 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☒ The drawing(s) filed on 15 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>06/09/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-10 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claim 1, it is unclear whether applicant intends an equivalency between the claimed "an open distillation system" as set forth in line 4 with the claimed "an open system" as set forth in line 5. In light of the present ambiguity, the particular metes and bounds of the Applicants invention are rendered unclear and indefinite

With respect to claim 6, Applicant recites the limitation wherein the "components of the chalcogenide precursor" are reacted to form "the precursor". Since Applicant has failed to clearly set forth antecedent basis for either of the "components of the chalcogenide precursor" or "the precursor", the claim is held to be unclear and ambiguous.

Applicant's recitation of limitations drawn to "the precursor component" in claim 7 line 1 lacks antecedent basis

Similarly, limitations drawn to "the chalcogenide precursor in claim 8 lines 1 and 2, Claim 9 line 1, and Claim 10 Line 1, lack antecedent basis.

Further in claim 9, it is unclear which precursor Applicant intends as the antecedent basis for the limitation drawn to "the precursor" in line 2.

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Finally, with respect to claim 12, Applicant has failed to provide antecedent basis for "the resulting" as presented in line 2. Additionally, it appears that applicant intends to further limit the genus "arsenic monochalcogenide precursor" to the species "arsenic monosulfide precursor". Since this limitation has not been clearly set forth, the instant claim is rendered unclear and indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Upton (US 3,209,641 and US 2,804,378) in view of (Churbanov et. al. (Journal of Optoelectronics and Advanced materials vol. 3, No. 2, June 2001, p. 341 – 349).

Upton '641 teaches the synthesis of a highly IR transmissive chalcogenide glass by reacting an arsenic sulphide glass cullet with raw sulfur followed by distillation and homogenization of the molten distillate. Specifically, the instant reference teaches that "In making arsenic trisulphide glass, for example, the proper related proportions, well-known to the glass making industry, of raw arsenic and sulphur with a cullet of crushed raw arsenic trisulphide glass synthesized by previously melting the rough stoichiometric proportions of arsenic metal and sulphur are placed in the distillation tube 62 for processing by boiling to form the above described vapor. By gradually increasing the temperature of the glass formed by the reaction between the ingredients 57 as it is vaporized, a relatively constant pressure can be maintained within the distillation tube to continually force the glass vapors through the transfer tube into the condensing tube (11)" (column 5, Line 68 to Column 6, Line 5).

The instant reference specifically cites a prior patent (US 2,804,387) as setting forth temperatures of distillation and condensation and that process steps of said patent "will serve as examples of those essential to the glass-making procedures of the present case" (Column 6, lines 14-17). Specifically, the '378 reference teaches that " It is particularly pointed out that the raw materials or cullet which is placed in the tube...(is heated) to a temperature of at least 700°C".

Upon completion of the above described distillation process, the distillation column is removed from the condensing unit, a fused quartz stirring rod is inserted in to the molten glass, and the "major portion of the opening 69" is closed (column 6, Lines 18-26). While maintaining the temperature of the sealed condenser unit

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at "approximately 550°C" (Column 6, Lines 70-71), the stirring rod is set in continuous motion to effect "a substantially complete homogenization of the molten glass" (Column 6, Lines 43-48).

The Upton process broadly discloses an open system which dynamically distills a mixture of a chalcogenide (e.g. sulfur) with an arsenic sulfide glass cullet which was synthesized in a reaction between a stoichiometric mixture of the constituent elements (As, S) of the cullet glass (**Claim 6**). Since Upton teaches that the making of arsenic trisulphide glass is "well-known to the glass making industry" (Column 5, line69-70), the limitation set forth in claim 7 wherein the "reacting of the precursor components is carried out at a temperature range of 300oC to 450oC" is held to be prima facie obvious over the prior art absent any unexpected results to the contrary. The mixture, which is loaded into the "hot section of the open system" is distilled and deposited in an adjacent "cold section of the open system" (**Claim 3**). The reagents are likewise broadly understood to transform in accord with the process into a product glass or "glassy state". Upton discloses that at least "the condensing tube is formed of fused quartz to resist chemical attack" (Column 3, Lines 65-72) in accord with applicants **Claim 2**, and as set forth above that the homogenization is conducted at approximately 550°C which reads upon the claimed homogenizing temperature of above 550°C as set forth in **Claim 4**. Since the ultimate production of a homogeneous or "uniform color" chalcogenide glass occurs in this homogenization step and since the "major portion of the of the opening 69" is closed, the Upton reference is understood to a process

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wherein the reaction between “the chalcogenide precursor and the chalcogenide takes place in a closed glass receptacle” resulting in a uniform color glass (Claim 10).

As indicated above, the Upton reference teaches the use of a “raw arsenic trisulphide glass” as precursor to the IR transmissive glass, but it is silent regarding the use of “arsenic monochalcogenide” as a precursor in the reaction. Further, although Upton teaches reactive distillation the reference is silent regarding the claimed process wherein the distillation process is conducted as a “vacuum distillation”. Finally with respect to **claim 12**, Upton fails to relate a specific rate of distillation for the sulfur and precursor.

With this in mind, Churbanov teaches the use of arsenic monosulfide in the formation of the chalcogenide glass citing that “this compound is more suitable for the ultrapurification from submicron particles because of the low viscosity of melts” (Pg 346, Paragraph 2-3). The reference continues by stating “vacuum distillation in an open and closed system allows 3-10 times decrease of the content of impurities of highly volatile substances and of submicron particles[17]”.

It would therefore have been obvious to one of ordinary skill in the art to substitute arsenic monosulfide for the arsenic trisulphide in the glass manufacture process as taught by Upton. The use of the monosulfide precursor would have been an obvious substitution to one of ordinary skill in the art at the time of the invention seeking to increase the product glass purity by reducing the inclusion of submicron particles therein.

Further, it would have been obvious to modify the Upton process to carry out the distillation by the "vacuum" technique as taught by Churbanov. In addition to explicitly stating the use of an open system vacuum distillation process as mentioned above, Churbanov teaches that "Impurities having a high value of diffusion coefficient, especially hydrogen, enter the chalcogenide melt. It was established [5] that hydrogen from quartz glass, containing 100ppm of hydrogen, enters the melt of the chalcogenide glass starting from 650°C". (Pg342, paragraph 5, lines 1-4). The technique of vacuum distillation is well established in the art as a means of separating a desired materials from byproducts at a lower temperature than can typically be achieved under normal pressure conditions (http://en.wikipedia.org/wiki/Vacuum_distillation). Since vacuum distillation permits materials separation at a lower temperature and since elevated process temperatures increase the content of some impurities in the product glass, utilizing the vacuum technique would have been an obvious approach to decreasing the impurity content through a lowered distillation temperature. It would therefore have been obvious to incorporate the vacuum distillation technique taught by Churbanov to the Upton teachings in order to decrease "the content of impurities of highly volatile substances" (e.g. hydrogen).

It is here noted in accord with Applicants **claim 5** that the distillation temperature of 700°C as set forth by Upton in the reference patent '378 is understood to read upon the claimed temperature range of below about 550°C. Without detracting from this point and for at least the reasons listed above, it would have been obvious for one of ordinary skill in the art to seek to reduce the distillation temperature to at least below 650°C to

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minimize the inclusion of hydrogen impurities in the final glass product. Therefore absent unexpected results to the contrary, distillation temperatures of "below about 550oC" are held as *prima facie* obvious over the prior art as indicated above.

As indicated above with respect to claim 12, Upton fails to set forth a specific rate of distillation of the arsenic sulfur precursor and sulfur. In the disclosed chalcogenide glass manufacture process, Churbanov teaches that "the purification efficiency is very sensitive to the evaporation rate and the melt viscosity" (Pg 346, paragraph 4, lines 6-7). With the relationship between product purity and distillation rate in hand, one of ordinary skill in the art at the time of the invention would reasonably have been expected to optimize the distillation rate in the open vacuum system to any value which yields a desirable balance between production rate and product purity. Therefore absent any unexpected results to the contrary, the instant claim which sets forth a specific distillation rate of " $500-1500 \times 10^{-3} \text{ g/cm}^2\text{-sec}$ " is held to be *prima facie* obvious over the prior art as here presented.

Claims 8, 9, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Upton and Churbanov as applied to claim 1 above, and further in view of Jerger (US 2,999,027). While Upton discloses the manufacture of the chalcogenide precursor, neither Upton nor Churbanov explicitly address the prospect of distilling and homogenizing the chalcogenide precursor as **claimed in 8 and claim 11(b)**.

Jerger teaches the "purification of the arsenic component of glasses of the character indicated by distilling arsenic disulfide (As_2S_2). This compound distills readily

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at the discrete boiling point of 565°C, representing the lowest boiling point of any arsenic sulfur combination in the liquid phase...My method further contemplates the subsequent addition of sulfur...in order to produce the appropriate glass composition.” (Column 4, Lines 1-18). The instant reference teaches that in order to achieve an optimum product “in the manufacture of glasses of the character indicated, it is necessary to use the purest raw materials possible”. Further, the reference teaches that “from the point of view of refining the raw materials, arsenic presents the greatest difficulty since at normal pressures it passes directly from the solid to the gaseous state on heating.”(Column 1, Lines 9-23). With the Jerger disclosure in mind, it would have been obvious to one of ordinary skill in the art at the time of the invention to “distill the chalcogenide precursor”. This would have been an obvious preliminary step to the Upton/ Churbanov process described above for one of ordinary skill seeking to obtain the highest quality chalcogenide glass by insuring “the purest raw material possible”.

Conclusion

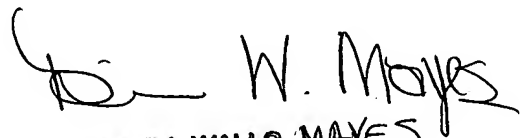
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Lazorcik whose telephone number is (571) 272-2217. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JLL


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PRIMARY EXAMINER